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STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

Northwest Region Office  
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March 20, 2024

Gary L. Zimmerman  
WSP  
18300 NE Union Hill Road, Suite 200  
Redmond, WA 98052-3333  
([Gary\\_Zimmerman@golder.com](mailto:Gary_Zimmerman@golder.com))

**Re: Review of 1,4-Dioxane Trend Analysis in LMW-4 and Groundwater Monitoring Frequency at the Landsburg Mine Site**

Dear Gary L. Zimmerman:

Thank you for submittal of the technical memorandum summarizing additional groundwater monitoring and statistical analysis of 1,4-Dioxane at the Landsburg Mine Site.

In accordance with the Amendment to the Cleanup Action Plan (Ecology, 2021) WSP previously conducted a minimum of 20 rounds of quarterly groundwater sampling at the Site and performed statistical analysis on the resulting data to evaluate concentration trends (WSP, 2023). The analytical data results for each of the three groundwater monitoring wells with 1,4-Dioxane detections (LMW-2, LMW-4, and LMW-12) were evaluated using Mann-Kendall and Theil-Sen tests.

Monitoring well LMW-2 and LMW-12 trends were found to be stable or decreasing using both methodologies. At well LMW-4, the Mann-Kendall method demonstrated an increasing trend, while the Theil-Sen method demonstrated no clear trend.

Ecology agreed that the trend analysis of LMW-2 and LMW-12 met the requirements of the Amendment to the Cleanup Action Plan to decrease groundwater sampling in accordance with the Compliance Monitoring Plan (Ecology 2017). However, because of the discrepancy of trends identified in LMW-4 data results, Ecology requested that WSP continue quarterly groundwater monitoring of that well in order to meet the requirements of the Amendment to the Cleanup Action Plan.

WSP conducted an additional four quarters of groundwater monitoring and analysis at LMW-4 and reevaluated the statistical data trend for the analytical results. Statistical analysis was performed using Mann-Kendall and Theil-Sen tests for 24 rounds of data. Both methods indicated that there were no statistically significant trends in the data and that 1,4-dioxane concentrations are generally steady.

Based on this review, and the prior statistical review performed on data from wells LMW-2 and LMW-12, Ecology concurs that the objectives of Ecology's 2021 Amendment to Cleanup Action Plan have been met. Groundwater monitoring schedule and analyses should continue at the Site in accordance with the 2017 Compliance Monitoring Plan. Continue to track 1,4-Dioxane analytical results and notify Ecology if trends differ from those reported in the two 1,4-Dioxane statistical trend memoranda.

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Likewise, continue construction of the contingent groundwater extraction and treatment system in accordance with the 2017 engineering plan. If you need Ecology support in communications with local jurisdictions for permitting or access, please let us know.

Please feel free to contact me by phone at (425) 324-1438 or by email at [vance.atkins@ecy.wa.gov](mailto:vance.atkins@ecy.wa.gov) if you have questions about this letter.

Sincerely,



Vance Atkins, LG, LHG

Hydrogeologist 4

Toxics Cleanup Program, NWRO

cc: William Kombol, Palmer Coking Coal Company, ([palmercokingcoal@aol.com](mailto:palmercokingcoal@aol.com))  
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